

COMPLETE LISTING OF CLAIMS
IN ASCENDING ORDER WITH STATUS INDICATOR

Claim 1 (currently amended): In a hub configured for interconnection of a plurality of stations as part of a digital system such that digital data flows between the stations through a main loop based on an operational status of the system, ~~the~~an improvement comprising:

an arrangement forming part of the hub and selectively connectable at points within the hub and between at least two different stations to form part of a diagnostics loop for monitoring certain characteristics of said data in a way which provides for noninvasive identification of one or more conditions related to the operational status of the system.

Claim 2 (original): The improvement according to Claim 1 wherein said arrangement monitors said certain characteristics of said digital data using ordered set detection.

Claim 3 (original): The improvement according to Claim 2 wherein said arrangement is configured for detecting a group of ordered sets including the idle character, LIP, LIP F7, LIP F8, SOP, ARB and OPN.

Claim 4 (original): The improvement according to Claim 2 wherein said arrangement includes a counter configured for counting the occurrence of a specified ordered set at anyone of said points.

Claim 5 (original): The improvement according to Claim 2 wherein said system is a Fibre Channel system and wherein said arrangement is configured for detection of any station transmitting a LIP F8 ordered set.

Claim 6 (original): The improvement according to Claim 5 wherein said system is configured for bypassing each of said stations individually and wherein said arrangement initiates bypass of any station transmitting LIP F8.

Claim 7 (currently amended): The improvement according to Claim 1 wherein said data flows between the stations using [a]the main loop which interconnects the stations so as to define said points and wherein said arrangement includes means for generating certain ordered sets to be introduced to the main loop.

Claim 8 (original): The improvement according to Claim 7 wherein said certain ordered sets are configured for diagnostic purposes.

Claim 9 (currently amended): The improvement according to Claim 7 wherein said means for generating the certain ordered sets to be introduced to the main loop is further configured for removing the certain ordered sets from the main loop.

Claim 10 (currently amended): The improvement according to Claim 1 wherein said points are defined as part of a Fibre Channel main loop extending between the stations on which operations are implemented using ordered sets and wherein said arrangement is configured for detecting a specific predetermined sequence of ordered sets which specific predetermined sequence is indicative of a series of operational states of the main loop and for indicating a current one of the operational states of the main loop.

Claim 11 (original): The improvement according to Claim 10 wherein the current operational state is indicated on said hub.

Claim 12 (currently amended): The improvement according to Claim 10 wherein the series of operational states of the main loop normally proceeds at startup or re-start from INOPERATIVE to INITIALIZING to OPEN-INIT to UP to UP+FRAME serving as said specific predetermined sequence of operational states.

Claim 13 (original): The improvement according to Claim 12 wherein loop initialization is indicated by a LIP ordered set and wherein said INITIALIZING state is entered upon detecting the LIP F7 ordered set.

Claim 14 (original): The improvement according to Claim 12 wherein said OPEN-INIT state is entered upon detecting a LIP ordered set followed by an ARB ordered set.

Claim 15 (original): The improvement according to Claim 12 wherein said UP state is entered upon detecting a LIP ordered set followed by an ARB ordered set followed by a CLS ordered set.

Claim 16 (original): The improvement according to Claim 12 wherein said UP+FRAME state is entered upon detecting a LIP ordered set followed by an ARB ordered set followed by a CLS ordered set followed by an SOP ordered set.

Claim 17 (currently amended): The improvement according to Claim 12 wherein said arrangement includes means for indicating that said main loop is operational and wherein said main loop is indicated as being operational in the UP and/or UP+FRAMES states.

Claim 18 (currently amended): The improvement according to Claim 1 wherein said data flows between the stations using [a]the main loop which interconnects the stations so as to define said points and said condition is a defect within the system and wherein said arrangement is configured for monitoring certain characteristics of said data at said points in a way which provides for non-invasive location of the defect.

Claim 19 (currently amended): The improvement according to Claim 1 wherein said data flows between the stations using [a]the main loop which interconnects the stations so as to define said points and wherein said arrangement is configured for connection to said points in a sequential manner such that only one of said points is monitored at a time.

Claim 20 (original): The improvement according to Claim 19 wherein said arrangement alternates from one of said points to a next one of said points at a predetermined interval.

Claim 21 (original): The improvement according to Claim 19 wherein said arrangement is configured for monitoring two or more of said points at a time.

Claim 22 (currently amended): The improvement according to Claim 1 wherein said data flows between the stations using [a]the main loop which interconnects the stations so as to define said points and wherein said hub is configured for interconnection of said stations using a series of ports, each one of said stations being physically ~~receivable~~inconnectable to one of the ports, said ports being interfaced with said main loop such that, each station after initially having been ~~received~~inconnected to one port, is insertable in the main loop via ~~by~~ the port so as to cause said digital data to flow through the station and such that each one of the stations is selectively and individually bypassable with respect to the main loop while the station is ~~received~~inconnected to one of the ports to prevent said digital data from flowing through each of the stations and wherein said arrangement is configured for initially maintaining a connecting station, initially ~~received~~inconnected to one of the ports and which may be defective, in a bypassed condition while verification of certain aspects of the operation of the station are performed such that insertion of the connecting station in the main loop is prevented if the connecting station is defective.

Claim 23 (original): The improvement according to Claim 22 wherein said arrangement verifies the operation of the connecting station by transmitting test data to the connecting station while bypassed and, thereafter, observes the response of the connecting station to the test data.

Claim 24 (currently amended): The improvement according to Claim 23 wherein the main loop is a Fibre Channel loop and said arrangement transmits LIP F7 to the connecting station as test data while bypassed.

Claim 25 (original): The improvement according to Claim 22 wherein said certain aspects of the operation of said stations include validation of data and loop attributes.

Claim 26 (currently amended): The improvement according to Claim 1 wherein said digital data flows between the stations using [a]the main loop which interconnects the stations so as to define said points and wherein said arrangement includes analysis means for analyzing the digital data obtained at said points in order to establish those certain characteristics of interest.

Claim 27 (original): The improvement according to Claim 26 wherein said analysis means includes means for verification of Fibre Channel compliance.

Claim 28 (currently amended): The improvement according to Claim 26 wherein said ~~arrangement includes a~~the diagnostics loop ~~separate from the main loop and~~is connected between the stations and with said analysis means, said diagnostics loop being configured for selectively copying the digital data from one of said points on the main loop at a time and, thereafter, for transmitting the copied digital data to said analysis means.

Claim 29 (original): The improvement according to Claim 28 wherein said main loop carries the digital data in one direction between the stations and wherein the diagnostics loop carries the copied digital data in an opposing direction between the stations with respect to the digital data carried on the main loop.

Claim 30 (original): The improvement according to Claim 28 wherein said analysis arrangement is configured for generating test data for testing a selected one of the stations such that the selected station, if operating properly, will respond in a predetermined way to the test data and said diagnostics loop is configured for carrying the test data to the selected one of the stations along one segment of the diagnostics loop extending from the analysis means to the selected station and for carrying the response of the selected station to the test data on another segment of the diagnostics loop extending from the selected station to the analysis means.

Claim 31 (original): The improvement according to Claim 30 wherein the hub includes means for bypassing each of the stations with respect to the main loop and wherein said analysis arrangement cooperates with said diagnostics loop to transmit the test data to the selected station while the selected station is bypassed so as to observe the response of the selected station without affecting the operation of any stations continuing to use the main loop.

Claim 32 (currently amended): The improvement according to Claim 30 wherein said hub is configured for interconnection of said stations using a series of ports, said ports being interfaced with said main loop such that each one of said stations is initially inserted into one of the ports and the inserted station is then selectively connectable with the main loop using said bypass means to cause said digital data to flow through the inserted station with respect to the main loop and selectively bypassable with respect to the main loop to prevent said digital data from flowing through the inserted station and wherein said analysis arrangement cooperates with said diagnostics loop and said bypass means to initially hold an inserted station in a bypassed condition prior to connection with the main loop until such time that the test data is transmitted to the inserted station and the predetermined response of the inserted station is observed by the analysis means via the diagnostics loop without affecting operation of other stations already using the main loop.

Claim 33 (original): The improvement according to Claim 1 including beaconing means for providing a beacon indication in a way which identifies a location associated with a particular one of said conditions.

Claim 34 (original): The improvement according to Claim 33 wherein said hub includes a series of ports such that each port connects one of the stations to the hub and, when said condition is a defect associated with a particular station, the location at which the beacon indication is provided is on said hub adjacent to the one of said ports to which the particular station is connected.

Claim 35 (original): The improvement according to Claim 33 wherein said beacon indication is provided at a position remote from said hub.

Claim 36 (original): The improvement according to Claim 1 wherein said hub is a Fibre Channel hub such that data frames pass through said hub, at least some of said data frames being subject to corruption within the system, and each data frame including a CRC for use in identifying corrupted data frames, and wherein said arrangement is configured for checking the CRC's of data frames passing through said points in a way which identifies corrupted ones of the data frames.

Claim 37 (original): The improvement according to Claim 36 wherein said arrangement is configured for examining the CRC's of data frames at each of said points in a way which isolates the corrupted frames to origination at a certain one of said points.

Claim 38 (original): The improvement according to Claim 36 wherein each data frame includes a source ALPA and wherein said arrangement is further configured for capturing the source ALPA of each of the corrupted ones of the data frames.

Claim 39 (currently amended): The improvement according to Claim 38 wherein said hub is configured for interconnection of said stations in [a]the main loop using a series of ports such that one or more of said stations may be serially connected to each of the ports, with the station or stations connected to each of the ports of the hub forming a lobe of the main loop and wherein said arrangement uses the captured source ALPA's of corrupted ones of the data frames in a way which indicates a particular station which is serially connected with at least one other station in one lobe of the main loop as a probable cause of the corrupted data frames.

Claim 40 (original): The improvement according to Claim 1 wherein said hub is a Fibre Channel hub such that said digital data passes through said hub, which digital data is subject to corruption within the system so as to violate a predefined transition density and wherein said arrangement is configured for identifying violations of the transition density by the digital data.

Claim 41 (original): The improvement according to Claim 40 wherein an indication that the main loop is down is provided upon identification of one or more violations of the transition density.

Claim 42 (original): The improvement according to Claim 1 wherein said hub is a Fibre Channel hub such that said digital data is in the form of Fibre Channel characters which pass through said hub, at least some of said Fibre Channel characters being subject to invalidation within the system so as to violate predefined Fibre Channel protocol standards and wherein said arrangement is configured for identifying invalid ones of the Fibre Channel characters.

Claim 43 (previously presented): The improvement according to Claim 42 wherein said arrangement is configured for examining the Fibre Channel Characters at each of said points in a way which identifies the invalid Fibre Channel characters to origination at a certain one of said points.

Claim 44 (currently amended): The improvement according to Claim 43 wherein said hub is configured for interconnection of said stations in [a]the main loop using a series of ports such that one or more of said stations may be serially connected to each of the ports, with the station or stations connected to each of the ports of the hub forming a lobe of the main loop and wherein said arrangement is further configured for providing an indication as to a defect associated with a particular lobe based on the invalid Fibre Channel characters detected.

Claim 45 (original): The improvement according to Claim 44 wherein said indication is given in the form of a recommendation that the physical interconnection between the station on the particular lobe and the hub should be checked or replaced.

Claim 46 (currently amended): In a hub configured for interconnection of a plurality of stations using a main loop as part of a digital system such that digital data flows between the stations on the main loop under specific operational conditions, ~~thean~~ improvement comprising the step of:

monitoring said digital data at a selectable plurality of points distributed within the hub and between at least two different stations ~~for use in determining~~ using a diagnostics loop to determine certain characteristics of said data in a way which provides for non-invasive identification of one or more conditions related to the operational status of the system.

Claim 47 (original): The improvement according to Claim 46 wherein each station is identified by an ALPA as one of the certain data characteristics of interest and wherein at least a preliminary map of said digital system is established by monitoring the ALPA's present at one or more of said points.

Claim 48 (original): The improvement according to Claim 47 wherein said ALPA's are examined at one of said points by using ARB commands issued by active ones of the stations such that the active stations are identified.

Claim 49 (original): The improvement according to Claim 47 wherein said ALPA's are examined using OPN commands in which different open commands uniquely identify different ones of the Stations in a way which serves to at least identify the destination of the data.

Claim 50 (currently amended): The improvement according to Claim 49 wherein the digital system is configured such that any one of the stations which receives its own ALPA as part of an OPN command on the main loop will not retransmit the OPN command including its own ALPA and anyone of the stations which receives an OPN command which does not include its ALPA will retransmit the OPN command on the main loop and wherein said preliminary map is established at least in part by observing for response of the stations to which the different OPN commands are directed.

Claims 51-126 (canceled)